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ABSTRACT

This guide, developed by a statewide committee in response to the legislature's mandate to develop statewide curriculum standards for required subjects, presents the content that should be taught in Algebra I. It was piloted by teachers in representative school systems and subsequently revised. Six goals for the course are listed, followed by a pacing chart suggesting the time to devote to each major topic. The major topics are the language of mathematics and algebra; operations on real numbers; first-degree equations and inequalities; polynomials; factoring monomials; multiplication and factoring of polynomials; fractions; linear equations and inequalities; real numbers, radicals, and quadratics; and relations and functions. The curriculum outline and performance objectives are then listed. In the following section, sample activities are presented, with content topic and objective noted for each. A brief list of books and other resources is given, evaluation techniques are noted, and an answer key to activities is provided. (MNS)

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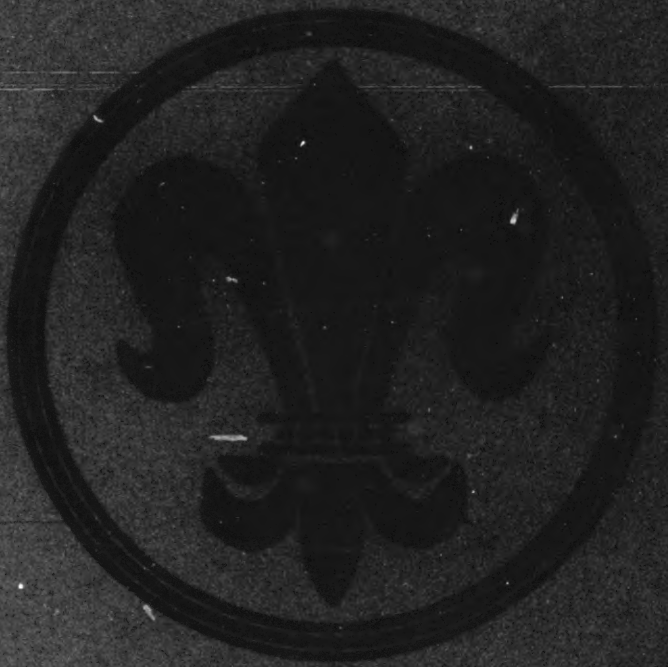
ALGEBRA I

CURRICULUM GUIDE

BULLETIN 1580
REVISED 1984



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STATE OF LOUISIANA

DEPARTMENT OF EDUCATION

ALGEBRA I CURRICULUM GUIDE

BULLETIN 1580

REVISED 1984

Issued by

Office of Academic Programs

J. KELLY NIX

State Superintendent

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FOREWORD

Curriculum guides have been developed for grades K-8 at the elementary level and for each mathematics course at the secondary level. These guides represent the best thinking of a selected statewide committee established to determine the scope of mathematics content which should be taught at each level.

The mathematics curriculum guides are another segment of the total educational program established by this administration and mandated by the Legislature in both the accountability and assessment and the competency-based education laws. This educational program requires that specific skills and concepts be established for each grade level and for each subject area. The mathematics curriculum guides with course outlines, performance objectives and coordinated activities effect this phase of the program.

It is hoped that the mathematics curriculum guides will make a major contribution to the improvement of mathematics instruction in the schools of Louisiana. This series of mathematics curriculum guides is another step toward achieving the goals of this administration.

J. KELLY NIX

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The Statewide Mathematics Curriculum Committee is to be commended for its work in the development of the Mathematics Curriculum Guide Series, K-12. Leadership for this project was provided by Dr. Jean Reddy Clement, Section Chief, Mathematics Section, Bureau of Secondary Education.

Supervisors in the Bureau of Elementary Education working under the direction of Mrs. Bonnie Ross, Elementary Supervisor, developed the activities for the K-8 guide. The activities for the secondary mathematics guides were written by a committee of secondary mathematics teachers and Dr. Clement. These dedicated educators are to be commended for their enthusiam in undertaking this formidable project and for the superb quality of their contributions to this unique and comprehensive Mathematics Curriculum Series.

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INTRODUCTION

Act 750 of the 1979 Louisiana Legislature established the Louisiana Competency-Based Education Program. One of the most important provisions of Act 750 is the mandated "development and establishment of statewide curriculum standards for required subjects for the public elementary and secondary schools of this state..." The "statewide curriculum standards for required subjects" is defined as "the required subjects to be taught, curriculum guides which contain minimum skills and competancies, suggested activities, suggested materials of instruction, and minimum required time allotments for instruction in all subjects." Act 750 further provides that the "effective implementation date of the statewide curriculum standards for required subjects shall be the 1981-82 school year. Development of such curriculum shall begin by the 1979-80 school year."

During the 1978-79 school year, curriculum guides were developed by advisory and writing committees representing all levels of professional education and all geographic areas across the State of Louisiana for the following mathematics courses: Algebra I, Algebra II, Geometry, Advanced Mathematics, and Trigonometry. The major thrust of the curriculum development process in each of the guides has been the establishment of minimum standards for student achievement. Learning expectancies for mastery have been determined for each course and/or grade level. In addition, content outlines, suggested activities, procedures, and bibliographies have been developed as aids in support of the learning expectancies. The curriculum guides also contain activities designed to stimulate learning for those students capable of progressing beyond the minimums.

During the 1979-80 school year, the secondary mathematics curriculum guides were piloted by teachers in school systems representing the different geographic areas of the state as well as urban, suburban, inner-city, and rural schools. The standard populations involved in the piloting reflected also the ethnic composition of Louisiana's student population. Participants involved in the piloting studies utilized the curriculum guides to determine the effectiveness of the materials that were developed. Based upon the participants' recommendations at the close of the pilot study, revisions were made in the curriculum guides to ensure that they are usable, appropriate, accurate, comprehensive, relevant, and clear. These curriculum guides were implemented statewide in the 1980-81 school year.

Following the established curriculum development procedures, curriculum guides for Mathematics I, Mathematics II, Consumer Mathematics, Business Arithmetic, and Computer Science were developed in 1979-80 and piloted in 1980-81. These curriculum guides were implemented statewide in the 1981-82 school year. This revision of the original guide has been prepared from suggestions collected statewide from teachers who have used the guide.

As curriculum guides are implemented, the following guidelines should prove helpful:

...curriculum standards should be considered as the foundation for the year's instructional program. Where other programs are already in operation, these curricular materials must be checked with the foundation curricula to ensure that appropriate course and/or grade level standards are included and maintained.

...curricular activities contained in the guides provide a number of suggestions for helping students to achieve the established standards. Activities to meet the needs of "average," "below average," and "above average" students have been included in the appropriate guides. These activities should prove helpful as the teacher plans and organizes instruction. Additional activities, however, may supplement or be used in lieu of those listed in the guide as long as these activities are designed to achieve similar specific objectives.

...curricular suggestions for meeting the needs of the special child have been prepared by the Office of Special Educational Services. These suggestions are designed to provide help for teachers who work with special children in the regular classroom.

The continued effort of mathematics teachers to provide quality instruction will enhance our statewide goal to ensure that every student in the public elementary and secondary schools of the State of Louisiana has an opportunity to attain and to maintain skills that are considered essential to functioning effectively in society.

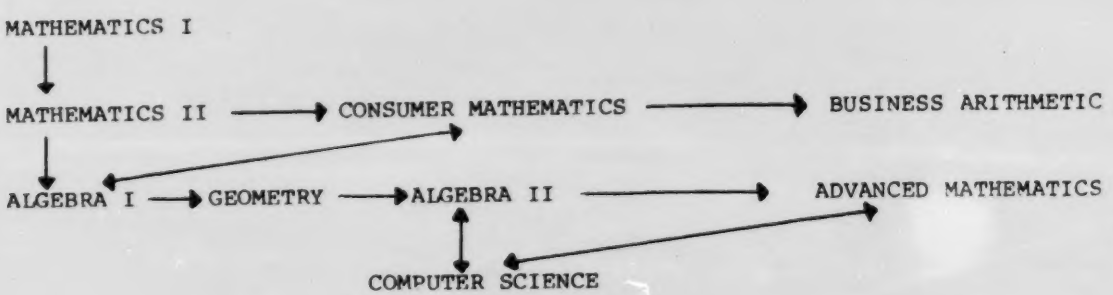
RATIONALE

Understanding the development of the entire set of mathematics curriculum guides is important to the proper use of the guides. This understanding is especially vital to the proper placement of students in the areas of Mathematics I, Mathematics II, Consumer Mathematics, and Business Arithmetic. To avoid unnecessary duplication and repetition of content, the writing committee selected those topics which were deemed most appropriate for each of these courses. These topics were then eliminated from the content of the other courses or were treated with less emphasis.

Teachers and counselors need also to be aware of the difficulty levels of these courses. Mathematics I, the most fundamental course, is designed for those students who are entering ninth grade and who have not acquired the basic skills in arithmetic. The stronger students who are still not quite prepared for success with Algebra I upon entering the ninth grade should be encouraged to schedule Mathematics II. Mathematics II is designed to strengthen mathematical background and to prepare students for Algebra I and Geometry. Every student who plans to go to college should take Algebra I (at least). It is recommended that they also take Geometry and Algebra II.

Consumer Mathematics, as the name indicates, treats that mathematics which each of us encounters routinely as a citizen and consumer. The content differs from that of Business Arithmetic in that Business Arithmetic approaches the topics from the viewpoint of either an employer or one engaged in business or manufacturing. It is not recommended that a student who has successfully completed Algebra II be allowed to take either Mathematics I or Mathematics II.

The accompanying diagram should aid in understanding some possible avenues a student may take in his secondary mathematics career.



GOALS

Upon completion of a first course in Algebra, the student will be able to:

1. Understand the basic structure of algebra.
2. Perform operations with real numbers and algebraic expressions.
3. Identify the solution set of linear and quadratic equations and inequalities.
4. Acquire a basic knowledge of coordinate geometry.
5. Perform multiple operations with polynomials.
6. Acquire skills in simplifying radicals.

PACING CHART

The following pacing chart contains suggested periods of time to devote to each major topic in the mandatory portion of this curriculum guide. Since students learn at different rates and days are lost during the school year for various reasons, this pacing chart is based on 32 weeks of school. This provides four weeks of school to be used as "pad" time in allowing for the factors affecting pacing. Should a group of students complete the mandatory material prior to the end of school, this guide provides ample optional and supplemental material to use as enrichment.

	TOPIC	NUMBER OF WEEKS
I.	Language of mathematics	1
II.	Operations on real numbers	2
III.	Language of algebra	5
IV.	First degree equations and inequalities in one variable	4
V.	Polynomials	4
VI.	Factoring monomials	1
VII.	Multiplication and factoring of polynomials	4
VIII.	Fractions	5
IX.	Linear equations and inequalities	3
X.	Real numbers, radicals, and quadratics	3
XI.	Relations and functions	(Time permitting)

CURRICULUM OUTLINE AND PERFORMANCE OBJECTIVES

CURRICULUM OUTLINE[1]	PERFORMANCE OBJECTIVES
I. Language of Mathematics	
A. Identification of symbols (page 20)	A. To develop an understanding of the language of mathematics, the student will be able to identify mathematical symbols: +, -, x, ÷, <, >, etc...
B. Set of real numbers (page 20)	B. To develop an understanding of real numbers, the student will be able to:
1. Definition	1. Define and identify real numbers.
2. Subsets	2. Identify subsets of real numbers.
C. Number line (page 21)	C. To demonstrate an understanding of a number line, the student will be able to:
1. Construction	1. Construct a number line.
a. Coordinate of a point	a. Assign a number to a designated point.
b. Graph of a number	b. Assign a point to a designated number.
2. Graphs of subsets	2. Graph various subsets of the real numbers.
3. Compare real numbers	3. Compare any two real numbers.
4. Absolute value	4. Define and determine the absolute value of any real number.

[1]NOTE: All items are mandatory unless preceded by an asterisk. All items with an asterisk should be taught if time permits (See Pacing Chart.) Parentheses indicate page numbers of corresponding activities.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
II. Operations on real numbers	
A. Order of operations (page 22)	A. To demonstrate an understanding of operations on real numbers, the student will be able to:
1. Without grouping symbols	1. Perform multiple operations without grouping symbols.
2. With grouping symbols	2. Perform multiple operations with grouping symbols.
B. Addition of real numbers (page 23)	B. To develop an understanding of operations on real numbers, the student will be able to:
1. Number line	1. Use a number line to add real numbers.
2. Rules	2. Use the rules for adding real numbers.
C. Subtraction of real numbers (page 23)	C. To develop an understanding of operations on real numbers, the student will be able to subtract real numbers by using the definition of subtraction.
D. Multiplication of real numbers (page 24)	D. To develop an understanding of the operations on real numbers, the student will be able to multiply real numbers.
E. Division of real numbers (page 24)	E. To develop an understanding of operations on real numbers, the student will be able to divide real numbers.
F. Axioms of real numbers (page 25)	F. To develop an understanding of operations on real numbers, the student will be able to recognize and use: 1. Axioms of closure 2. Commutative axioms 3. Associative axioms

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
	4. Additive axiom of zero 5. Axiom of opposites 6. Axiom of an opposite of a sum 7. Distributive axiom 8. Multiplicative axiom of 1 9. Multiplicative axiom of 0 10. Multiplicative axiom of -1 11. Axiom of opposites in products 12. Axiom of reciprocals
III. Language of Algebra	
A. Algebraic expressions (page 26)	A. To demonstrate an understanding of algebraic expressions, the student will be able to:
1. Definitions and identifications	1. Define and identify mathematical terms. a. Constant b. Variable c. Base d. Exponent e. Coefficient f. Factor g. Term h. Algebraic expressions
2. Evaluation	2. Evaluate algebraic expressions
B. Linear equations (page 27)	B. To demonstrate an understanding of linear equations, the student will be able to:

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
1. Definitions and identification	1. Define and identify mathematical terms. a. Equation b. Open sentence c. Replacement set d. Root e. Solution set f. Member of an equation g. Linear equation
2. Axioms of equality	2. Use reflexive, symmetric, and transitive axioms.
3. Other properties of equality	3. Use a. Substitution property of equality b. Addition property of equality c. Subtraction property of equality d. Multiplication property of equality e. Division property of equality.
4. Solving linear equations in one variable	4. Use the properties of equality to solve linear equations in one variable.
*5. Solving compound sentences (page 28)	*5. Use the properties of equality to solve compound sentences that involve absolute value.

*Optional

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
C. Linear inequalities (page 28)	C. To develop an understanding of linear inequalities, the student will be able to:
1. Definition	1. Define and identify a linear inequality.
2. Properties	2. Use
	a. Trichotomy property (axiom of comparison),
	b. Transitive property of inequalities,
	c. Subtraction property of inequalities,
	d. Multiplication property of inequalities, and
	e. Division property of inequalities.
3. Solving linear inequalities in one variable	3. Use the properties of inequalities to solve linear inequalities.
4. Graphs	4. Graph the solution set of linear inequalities.
5. Compound sentences (page 29)	5. Solve compound sentences that involve linear inequalities.
a. Without absolute value	a. That do not involve absolute value
*b. With absolute value	*b. That do involve absolute value
6. Graphs of compound sentences	6. Graph the solution set of compound sentences that involve linear inequalities.

*Optional

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
a. Without absolute value	a. That do not involve absolute value
*b. With absolute value	*b. That do involve absolute value
IV. First Degree Equations and Inequalities in One Variable	
A. Linear equations (page 29)	A. To demonstrate an understanding of linear equations, the student will be able to solve equations that have variables in both members of the equation.
B. Inequalities in one variable (page 30)	B. To demonstrate an understanding of inequalities in one variable, the student will be able to solve inequalities that contain variables in both members of the inequality.
C. Translation (page 30)	C. To demonstrate an understanding of translation, the student will be able to translate verbal expressions to algebraic expressions and vice versa.
D. Applications (page 31)	D. To demonstrate an understanding of linear equations, the student will be able to use linear equations to solve problems that involve number relations. 1. Number problems 2. Consecutive integer problems 3. Geometry problems 4. Distance problems 5. Coin problems 6. Age problems
V. Polynomials	
A. Introduction to polynomials (page 33)	A. To develop an understanding of polynomials, the student will be able to:

*Optional

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
1. Definition and identification	1. Define and identify listed mathematical terms.
	a. Monomial
	b. Binomial
	c. Trinomial
	d. Polynomial
	e. Degree of a polynomial
	f. Coefficient
2. Arrangement of terms	2. Write the terms of a polynomial in descending or ascending order.
B. Operations on polynomials (page 34)	B. To demonstrate an understanding of operations on polynomials, the student will be able to:
1. Addition	1. Add polynomials by combining similar terms.
2. Subtraction	2. Subtract polynomials by combining similar terms.
3. Laws of exponents (multiplication)	3. Use the laws of exponents to find products.
a. Two or more monomials	a. Two or more monomials
b. Polynomial by a monomial	b. A polynomial by a monomial
c. Polynomials	c. Two polynomials
4. Laws of exponents (division) (page 37)	4. Use the laws of exponents to divide.
a. Monomials	a. Two monomials

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
b. Polynomial by a monomial	b. A polynomial by a monomial
c. Polynomials	c. Two polynomials
5. Laws of exponents (Zero and Negative exponents)	5. Use the laws of exponents to write equivalent expressions for monomials with a zero or negative exponent leaving answers with positive exponents only.
VI. Factoring Monomials	
A. Prime factors of integers (page 40)	A. To demonstrate an understanding of factoring, the student will be able to define and find the prime factors of two or more integers.
B. Greatest common factor (page 41)	B. To demonstrate an understanding of factoring, the student will be able to find the greatest common factor.
1. Numerical expressions	1. Numerical expressions
2. Monomials	2. Monomials
VII. Multiplication and Factoring of Polynomials	
A. Multiplying (page 41)	A. The student will be able to multiply binomials.
B. Factoring (page 42)	B. To demonstrate an understanding of factoring, the student will be able to factor special types of polynomials.
	1. Greatest monomial factor of a polynomial
	2. Difference of two squares

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
	3. Grouping methods
	4. Trinomial square
	5. General method of factoring quadratic trinomials
	6. Combinations of all of the above
C. Quadratic equations (page 43)	C. To demonstrate an understanding of factoring, the student will be able to:
1. Solutions by factoring	1. Solve quadratic equations by factoring.
*2. Applications	*2. Solve verbal problems by using and factoring quadratic equations.
VIII. Fractions	
A. Common fractions (page 44)	A. To demonstrate an understanding of fractions, the student will be able to perform fundamental operations on common fractions.
B. Algebraic fractions (page 45)	B. To demonstrate an understanding of fractions, the student will be able to:
1. Definition	1. Define an algebraic fraction.
2. Restricted values	2. Determine the restricted value of an algebraic fraction.
3. Reducing fractions	3. Reduce algebraic fractions.

*Optional

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
4. Multiplication	4. Find the product of two or more algebraic fractions.
5. Division	5. Find the quotient of two or more algebraic fractions.
6. Least common multiple	6. Find the least common multiple of two or more algebraic expressions.
7. Combining fractions	7. Combine fractions by addition and subtraction.
8. Mixed expressions	8. Simplify mixed expressions by adding a polynomial and a fraction.
*9. Complex fractions	*9. Simplify complex fractions.
C. Fractional equations (page 48)	C. To demonstrate an understanding of fractions and fractional equations, the student will be able to solve first degree fractional equations.
*D. Fractional inequalities (page 49)	*D. To demonstrate an understanding of fractions and fractional inequalities, the student will be able to solve first degree fractional inequalities.
*E. Work and motion problems (page 49)	*E. The student will be able to solve work and motion problems using fractional equations.
IX. Linear Equations and Inequalities	
A. Terminology (page 49)	A. To develop an understanding of linear equations and inequalities the student will be able to identify the listed mathematical terms.

*Optional

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
1. Rectangular coordinate system	
2. Ordered pair	
3. Horizontal axis	
4. Vertical axis	
5. Origin	
6. Quadrants	
7. Abscissa	
8. Ordinate	
9. Graph of a linear equation	
10. Graph of a linear inequality	
11. x intercept	
12. y intercept	
13. Slope of a line	
14. System of equations	
B. Graphing (page 50)	B. To develop an understanding of the graph of a line, the student will be able to:
1. Location of points	1. Locate and relate points in a plane to ordered pairs of numbers.
2. Linear equations	2. Graph linear equations in two variables.
3. Linear inequalities	3. Graph linear inequalities in two variables.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
C. Slope of a line (computation) (page 51)	C. To develop a basic understanding of slopes of lines, the student will be able to find the slope of a line given:
1. Graphing	1. The graph of a line.
2. Coordinates of two points	2. The coordinates of two points of a line.
3. Equation of a line	3. A equation of the line.
D. Equations of a line (page 52)	D. To develop an understanding of equations of lines, the student will be able to write linear equations in:
1. Slope-intercept form	1. Slope-intercept form.
2. Point-slope form	2. Point-slope form.
E. Systems of linear equations (page 53)	E. To develop an understanding of systems of linear equations, the student will be able to:
1. Graphing	1. Solve systems of equations by graphing.
2. Linear-combination	2. Solve systems of equations by the addition and subtraction method.
3. Substitution method	3. Solve systems of equations by the substitution method.
*4. Applications	*4. Solve verbal problems by using systems of linear equations.
*F. Systems of linear inequalities (graphing) (page 55)	*F. To develop an understanding of linear inequalities, the student will be able to determine the solution set of systems of linear inequalities by graphing.

*Optional

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
X. Real Number, Radicals, and Quadratics	
A. Real numbers (page 56)	A. To demonstrate an understanding of real numbers, the student will be able to define and/or identify the listed mathematical terms.
	1. Terminating decimals
	2. Repeating decimals
	3. Rational numbers
	4. Irrational numbers
	5. Principal square root
B. Squares (numerals and variables) (page 56)	B. To demonstrate an understanding of squares, the student will be able to find the squares of numerals and variables.
C. Square roots (page 56)	C. To demonstrate an understanding of square roots, the student will be able to:
1. Square roots of perfect squares (numerals and variables)	1. Find the square root of a perfect square.
2. Square root of monomials	2. Simplify monomial square roots.
D. Radical expressions (page 57)	D. To demonstrate an understanding of radicals, the student will be able to:
1. Properties of radicals	1. Identify and use the multiplication and division properties of radicals.
2. Simplifying radicals	2. Simplify radical expressions.
3. Computations with radicals	3. Perform operations on radicals that involve:

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
a. Multiplication and division	a. Multiplication and division.
b. Addition and subtraction	b. Addition and subtraction.
c. Rationalize the denominator	c. Rationalizing the denominator of fractions.
E. Quadratic equations (page 59)	E. To demonstrate an understanding of quadratic equations, the student will be able to:
1. Solution of quadratic equations	1. Solve quadratic equations.
a. Factoring	a. Factoring
*b. Completing the square	*b. Completing the square
c. Quadratic formula	c. Using the quadratic formula
2. Applications	2. Solve verbal problems whose solutions involve quadratic equations.
*F. Radical equations (page 60)	*F. To demonstrate an understanding of radicals, the student will be able to solve radical equations.
*G. Quadratic inequalities (page 61)	*G. To demonstrate an understanding of inequalities, the student will be able to solve quadratic inequalities.
*XI. Relations and Functions	
*A. Relations (page 61)	*A. To demonstrate an understanding of relations, the student will be able to:
1. Definition	1. Define a relation.

*Optional

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
2. Domain	2. Define and/or determine the domain of a relation.
3. Range	3. Determine the range of a relation.
*B. Functions (page 62)	*B. To demonstrate an understanding of functions, the student will be able to:
1. Definition	1. Define a function.
2. Domain	2. Define and/or determine the domain of a function.
3. Range	3. Determine the range of a function.
4. Functional notation	4. Find elements of the range of a function by using functional notation.

*Optional

ACTIVITIES

The sample items included in this Activity Section are presented as examples of problems which are indicative of the skills listed in the curriculum objectives.

ACTIVITIES

I. A. CONTENT: Language of Mathematics; Identification of Symbols

OBJECTIVE: The student will be able to identify mathematical symbols: +, −, x, ÷, <, >, (), [], etc.

ACTIVITIES: Identify all mathematical symbols used in each of the following:

(a) $3 + 4 = 7$

(b) $4 - 2$

(c) 3×5

(d) $4 \div 2$

(e) $12 > 10$

(f) $5 \geq 4$

(g) $4 < 8$

(h) $7 \leq 10$

(i) $(3 + 7) \div 5$

I. B. (1,2) CONTENT: Language of Mathematics; Set of Real Numbers

OBJECTIVE: The student will be able to define and identify:

(a) Real numbers

(b) Subsets of the real numbers

ACTIVITIES: Match letters to numbers

Let A = {natural numbers}	1. {All numbers on the number line}
B = {whole numbers}	2. {0,1,2,3,...}
C = {integers}	3. {...-2,-1,0,1,2...}
D = {rational numbers}	4. {1,2,3...}
E = {irrational numbers}	5. {-1,-1/2,0,7/16,.68, 103}
F = {real numbers}	6. {$\sqrt{2}$,.010010001...,}

I.C. CONTENT: Language of Mathematics; Number Line

OBJECTIVE: The student will be able to:

(1) Construct a number line,

(2) Graph various subsets of real numbers,

(3) Compare real numbers, and

(4) Determine absolute value of a real number.

ACTIVITIES: (1 and 2) Graph;

(a) $y \geq 7$

(b) $x < 2$

(c) $-1 \leq x \leq 1$

(3) Supply the missing symbols (<, >, =) to make a true statement.

(a) (7) ? (10)

(b) (-3) ? (5)

(c) (-3) ? (-2)

(d) (-7) ? (-12)

(e) (0) ? (-2)

(f) (6) ? (-6)

(g) -(-1/2) ? 1/2

(4) Supply the missing details:

(a) $|-7| =$?

(b) $|8 - 4| =$?

(c) $|17| =$?

(d) $|-7| - |-2| =$?

(e) $-|-6| =$?

(f) $|n| =$? if $n < o$

(g) $|n| =$? if $n > o$

(h) $|-n| =$? if $n < o$

II.A. CONTENT: Operations on Real Numbers; Order of Operations

OBJECTIVE: The student will be able to:

(a) Perform multiple operations without grouping symbols.

(b) Perform multiple operations with grouping symbols.

ACTIVITIES: (a) Perform the indicated operations (in these exercises x indicates multiplication).

(1) $5 + 3 \times 7$

(2) $15 - 6 \times 2$

(3) $16 \div 8 \times 2$

(4) $24 \div 2 \times 3 + 6 \times 2 \div 3$

(5) $36 \div 9 - 3 + 6 \div 2$

(b) Perform the indicated operations.

(1) $3 \times (6 - 2) + 5$

(2) $12 - (3 - 1/2)$

(3) $36 \div (9 \times 2)$

(4) $24 \div (2 \times 3) + 6 \times (12 \div 3)$

(5) $48 \div (2 + 6) + 4 \times (8 \div 2)$

(6) $2\{3(4-2) + 18 \div (2 \times 3)\}$

II.B. CONTENT: Operation on Real Numbers; Addition of Real Numbers

OBJECTIVE: The student will be able to:

(a) Use a number line to add real numbers.

(b) Develop and use the rules for adding real numbers.

ACTIVITIES: (a) Draw a number line and use it to add each of the following:

(1) (+3) + (+2)

(2) (-7) + (+2)

(3) (-8) + (-4)

(4) (+7) + (-5)

(b) Use the rules for addition to add the following.

(1) 3 + 7

(2) 7 + (-8)

(3) -16 + (-12)

(4) -15 + 32

(5) 2 + (-8) + (-7) + 3

(6) -1/2 + 2/3

II.C. CONTENT: Operations on Real Numbers; Subtraction of Real Numbers

OBJECTIVE: The student will be able to subtract real numbers by using the definition of subtraction.

ACTIVITIES: (a) Simplify

(1) 7 - 5 =

(2) -6 - 3 =

(3) -6 - (-2) =

(4) -36 - 4 =

(5) -5 - 4 + 2 - (-3) + 7 =

(b) Subtract

(1) $\begin{array}{r} 8 \\ -\ 6 \\ \hline \end{array}$

(2) $\begin{array}{r} -8 \\ -\ 3 \\ \hline \end{array}$

(3) $\begin{array}{r} -16 \\ -\ -12 \\ \hline \end{array}$

(4) $\begin{array}{r} 16 \\ -\ -12 \\ \hline \end{array}$

II.D. CONTENT: Operations on Real Numbers; Multiplication of Real Numbers

OBJECTIVE: The student will be able to multiply real numbers.

ACTIVITIES: Find the product.

(a) $(-5)\ (4) =$

(b) $-6\ \ (-2) =$

(c) $-6 \times 3 =$

(d) $(-1/2)\,(2/3) =$

(e) $(-1)\,(5)\,(-2)\,(3) =$

(f) $(-\ 1/4)\,(3/5)\,(-25)\,(-16) =$

II.E. CONTENT: Operation on Real Numbers; Division of Real Numbers

OBJECTIVE: The student will be able to divide real numbers.

ACTIVITIES: Find the quotient.

(a) $\frac{5}{-5}$

(b) $-8 \div 2 =$

(c) $\frac{-6}{-3}$

(d) $\frac{4}{-8}$

(e) $\frac{6(-2)}{-3(-1)}$

(f) $\frac{(-4)(-8)}{(-1)(-3)(-4)}$

II.F. CONTENT: Operations on Real Numbers; Axioms of Real Numbers

OBJECTIVE: The student will be able to recognize and use the axioms of real numbers.

ACTIVITIES: (a) Name the axiom that justifies each of the following:

(1) $3 + 2 = 2 + 3$

(2) $(2)(3) = (3)(2)$

(3) $4(5+2) = 4(5) + 4(2)$

(4) $7 + 0 = 7$

(5) $6(3) + 6(5) = 6(3 + 5)$

(6) $(4)(5 \cdot 6) = (4 \cdot 5)6$

(7) $3 + (-3) = 0$

(8) $5 \cdot 1 = 5$

(9) $(-1)(3) = -3$

(10) $(8)(0) = 0$

(11) $(3 + 4) + 2 = 3 + (4 + 2)$

(12) $\frac{2}{3} \cdot \frac{3}{2} = 1$

(13) $(4 + 3) + 2 = (3 + 4) + 2$

(14) $4(5 + 2) = 4(2 + 5)$

(15) $4(5 + 2) = (5 + 2)\ 4$

(b) Name the axiom that justifies each step.

(1) $(a + b) + c = a + (b + c) = a + (c + b)$

(2) $5(7c) = (5 \cdot 7)c = 35c$

(3) $6 + (2 + c) = (6 + 2) + c = 8 + c$

(4) $5(c + 0) = 5 \cdot c + 5 \cdot 0 = 5c + 0 = 5c$

III.A CONTENT: Language of Algebra; Algebraic Expressions; Evaluation

OBJECTIVE: The student will be able to:

(a) Define and identify the mathematical terms listed on page 6.

(b) Evaluate algebraic expressions given a replacement set for the variable.

ACTIVITIES: (a) Evaluate each expression for the given values of the variable.

(1) $2x + 5;\ x = 2$

(2) $5(a - 1);\ a = -2$

(3) $2a - 3b;\ a = 5,\ b = -2$

(4) $a^2 - 2b^2;\ a = 3,\ b = -2$

(5) $\frac{x+2y}{3x};\ x = 7,\ y = -2$

(6) $(x + y)^2;\ x = 4,\ y = 3$

(7) $x^2 + y^2;\ x = 4,\ y = 3$

(8) $\frac{ab^2}{2} + 3a;\ a = -2,\ b = 4$

(b) Find all values of each expression given that the replacement set for x is $\{1, 3\}$ and the replacement set for y is $\{-2, -1\}$

(1) $2x - 3y$

(2) $x^2 - y^2$

III.B. (1,2)

CONTENT: Language of Algebra; Linear Equations; Definitions and Axioms

OBJECTIVE: The student will be able to:

(a) Define and identify the mathematical terms listed on page 7.

(b) Use the axioms of equality.

ACTIVITIES: Identify each of the following as reflexive, symetric or transitive.

(a) $3 = 3$

(b) If $a = b$ and $b = 5$, then $a = 5$

(c) If $10 = c$, then $c = 10$

III.B. (3,4)

CONTENT: Language of Algebra; Linear Equations; Other Properties of Equality; Solving Linear Equations in One Variable

OBJECTIVE: The student will be able to use the properties of equality to solve linear equations in one variable.

ACTIVITIES: Find the solution set of each of the following.

(a) $x - 6 = 10$

(b) $24 = 2x$

(c) $10y + 6 = -84$

(d) $32 - x = 14$

(e) $\frac{3}{4}x = 12$

(f) $-\frac{2}{3}x = 18$

(g) $-\frac{3}{4}x = \frac{5}{2}$

(h) $\frac{3n}{2} + \frac{7}{2} = 11$

(i) $-18 = \frac{2}{3}x - 12$

(j) $8 - 3x = 20$

(k) $3z + 12 = 0$

*III.B. (5)

CONTENT: Language of Algebra; Linear Equations; Solving Compound Sentences

OBJECTIVE: The student will be able to use the properties of equality to solve compound sentences that involve absolute value.

ACTIVITIES: Find the solution set.

(a) $|y| = 7$

(b) $|-a| = 6$

(c) $|x - 4| = 0$

(d) $|x + 2| = 4$

III.C. (1,2,3,4)

CONTENT: Language of Algebra; Linear Inequalities; Definitions and Properties; Solutions; Graphs

OBJECTIVE: The student will be able to:

(a) Define and identify a linear inequality.

(b) Use the properties of inequalities to solve and graph the solution set of linear inequalities.

ACTIVITIES: Solve each inequality and graph the solution set on a number line.

(a) $x - 2 > 4$

(b) $5y + 3 \geq 18$

(c) $2 - 3s < 11$

(d) $-3p < -12$

(e) $5 \leq -3x - 13$

(f) $\frac{1}{2}x \leq -\frac{3}{4}$

(g) $-3 < \frac{2}{3}p - 1$

(h) $4(\frac{1}{4} + \frac{x}{2}) > 1$

*Optional

III.C. (5,6) CONTENT: Language of Algebra; Solving Compound Sentences Involving Inequalities; Graphs

OBJECTIVE: The student will be able to:

(a) Use the property of inequalities to solve compound sentences that involve inequalities.

(b) Graph the solution set of compound sentences that involve inequalities.

ACTIVITIES: Solve each compound sentence and graph the solution set on a number line.

(a) $1 \leq y + 7 < 6$

(b) $-15 < 4b - 5 < -9$

(c) $6m - 3 > 9$ or $6m - 3 < -9$

(d) $-4 + n < +3$ and $2 + n > 3$

(e) $5 - 2x > 7$ or $3x < 9$

(f) $x - 1 > -1$ and $x - 2 \leq 0$

(g) $8 \leq -1 + 3a < 11$

(h) $2x > 6$ and $3x > -6$

*(i) $|x - 4| > 2$

*(j) $|x + 2| \leq 3$

IV.A. CONTENT: First Degree Equations and Inequalities; Linear Equations

OBJECTIVE: The student will be able to solve first degree equations that have variables in both members of the equations.

ACTIVITIES: (a) Solve for x.

(1) $7x = 10 + 2x$

(2) $x = 4x + 30$

(3) $8x + 17 = 5x + 35$

*Optional

(4) $12x - 5 = 8x - x + 50$

(5) $\frac{2x}{3} - \frac{1}{2} = \frac{2x+5}{6}$

(6) $.8x = .2x + 36$

(7) $\frac{17}{2}x = \frac{39}{2} + 22$

(8) $4x - 2d = 3d$

(9) $cx = 2m$

(10) $abx = a^2b^2 - a^3b$

(b) Solve for x.

(1) $2x - (x + 6) = 10$

(2) $7x - (4x - 39) = 3$

(3) $3(x - 5) = 2(2x + 1)$

(4) $2(x + 1) - 3(2x + 3) = 3x$

(5) $2\{5x - 2(x - 3)\} = 3x + 7$

IV.B. CONTENT: First Degree Equations and Inequalities; Inequalities in One Variable

OBJECTIVE: The student will be able to solve inequalities that contain variables in both members of the inequality.

ACTIVITIES: Find the solution set.

(a) $2x - 6 < x + 3$

(b) $3(x + 2) > 4x$

(c) $\frac{4x+1}{6} + \frac{3x}{4} \geq \frac{2x-4}{3}$

(d) $3(x - 4) - 2(2x - 3) \leq -3(x + 6)$

IV.C. CONTENT: First Degree Equations and Inequalities; Translation

OBJECTIVE: The student will be able to:

(a) Translate verbal expressions to algebraic expressions.

(b) Translate algebraic expressions to verbal expressions.

ACTIVITIES: Translate each word phrase into an algebraic expression.

(a) The sum of b and 8

(b) x diminished by y

(c) The product of s and t

(d) 12 increased by 8

(e) 5 less than d

(f) 5 more than twice c

(g) 6 less than two times m

(h) Seven diminished by the sum of 2 and c

(i) Five times the sum of 2 and y

(j) The square of the product of 3 and x

(k) The square of the sum of 3 and x

IV.D. CONTENT: First Degree Equations and Inequalities; Applications

OBJECTIVE: The student will be able to use linear equations to solve problems that involve number relations, consecutive integers, geometry, money, age, and distance.

ACTIVITIES: (a) Number problems

(1) The sum of twice a number and 16 is 86. Find the number.

(2) Seventeem less than twice a number is 109. Find the number.

(b) Consecutive integer problems

(1) The sum of two consecutive integers is 35. Find the integers.

(2) The sum of three consecutive odd integers is 105. Find the integers.

(3) Find three consecutive odd integers so that five times the greatest decreased by six times the least is nine.

(c) Geometry problems

(1) The sum of the length and width of a rectangle is 42cm. If twice the length is one cm less than three times the width, find the dimensions of the rectangle.

(2) The base of a triangle has the same length as a side of a square. The other two sides of the triangle are 2 cm and 6 cm longer than the base. If the perimeter of the square equals the perimeter of the triangle, find the lengths of the sides of the triangle.

(d) Distance problems

(1) Two trains leave the same station at the same time and travel in opposite directions. If their rates are 50 mph and 60 mph, in how many hours will they be 660 miles apart?

(2) A salesman made a 375-mile trip by traveling 3 hours by bus and 4 hours by train. The train's average speed was 15 mph more than the average speed of the bus; find the rates of each.

(e) Coin problems

(1) Hilda has $2.15 in dimes and quarters. If she has four more dimes than quarter, how many dimes does she have?

(2) A soft drink machine takes nickels, quarters, and dimes. If a week's receipt of $21.30 contained 17 more dimes than quarters and 24 fewer nickels than quarters, how many nickels did the machine contain?

(f) Age Problems

(1) Bob is twice as old as Emma and Emma is 16 years younger than Tom. If the sum of their ages is 60 years, what is the age of each?

(2) Jack's father is 4 times as old as Jack is now. In 5 years Jack's father will be 3 times as old as Jack is then. How old is Jack now?

V.A. CONTENT: Polynomials; Introduction to Polynomials

OBJECTIVE: The student will be able to:

(a) Define and identify mathematical terms listed on page 10.

(b) Write the terms of a polynomial in descending or ascending order.

ACTIVITIES: (a) Identify each polynomial as either a monomial, binomial, or trinomial. Determine the numerical coefficient of each term and find the degree of the polynomial.

(1) $2x^3 + 6$

(2) $3x - 6x^2 + 8$

(3) $x^3 - x^4 + x$

(4) $6x^5 + x^3$

(5) 7

(6) $-5x + 6$

(b) Write each of the polynomials in descending order.

(1) $5x^2 + 6x^3 + 4x - 5$

(2) $x^2 - 6 + 3x^8 - 7x^4$

(3) $p^3 - 1 + 2p^5 + 2p - p^2 - p^4$

(4) $-3c^4 + 4d^3 + 3c^2d^2 - 5 + 2c^3d$

V.B. (1) CONTENT: Polynomials; Operations on Polynomials; Addition

OBJECTIVE: The student will be able to add polynomials by combining similar terms.

ACTIVITIES: Perform the indicated operations.

(a) $x^3 - 2 + x^2 + 5x^3 - 8 + 7x^2$

(b) $2xy^2 + 3x^2y - 6xy^2 - 5x^2y$

(c) $2x + 4x^2 - 7 + x^2 + 7 - 8x$

(d) $(5x^2 - 2x + 7) + (-4x - 7x^2 - 9)$

(e) $2x^3 + 7 - 3x^2 + (-5x^3 + x^4 - 8x^2)$

(f) $-3a^3b - 2a^2b^2 + 6a^3b - 5ab^2 + 7a^2b^2 + ab^2$

V.B. (2)

CONTENT: Polynomials; Operations on Polynomials; Subtraction

OBJECTIVES: The student will be able to subtract polynomials by using the definition of subtraction and combining similar terms.

ACTIVITIES: (a) Subtract.

(1) Subtract $5x^2 - 8x - 10$ from $- 6x^2 - 3x - 8$

(2) From $3a + 7b + 6c$ subtract $-8a - 2b + 2c$

(3) Subtract $- 3x^2 + 5x - 2$ from $x^3 - 4x^2 - 4$

(4) From $8x^3 - 6x + 2$ subtract $2x^2 - 8x - 9$

(b) Simplify

(1) $5x - (2x - 3)$

(2) $5x^2 - 2x - (-8x^2 - 6x + 7)$

(3) $-9x^3 - (-2x^2 + 3x^3 - 6x) + 3x^2 - 12x + 2$

(4) $3x^2 - \left\{ 6x - (-2x - x^2) + 6 \right\} + 4$

V.B. (3a)

CONTENT: Polynomials; Operations in Polynomials; Laws of Exponents; Multiplication of Monomials

OBJECTIVE: The student will be able to use the laws of exponents to multiply monomials.

ACTIVITIES: (a) Perform the indicated operations.

(1) $(a^3)\ (a^2)$

(2) $(3x^2)\ (2y^4)$

(3) $(a^2)\ (2a^3)\ (a)$

(4) $(3^5)\ (3^2)$

(5) $(9xy)\ (3xy)$

(6) $(-4a^2b)\ (2ab^3)$

(7) $(2r^4s)\ (8rs)\ (r^2s^2)$

(8) $(-\frac{3}{4}a)\ (8ab)\ (2a^2b^3)$

(9) $(r^2s)\ (2r^3s^2)\ (rs^3)\ (-r^2s)$

(b) Perform the indicated operations.

(1) $(x^2)^3$

(2) $(x^3)\ (x^3)$

(3) $(-3a)^2$

(4) $(-2a^2)^3$

(5) $3(-2a)^2$

(6) $(2x)^2(-3x)^2$

(7) $(-2x)^2(2x)^2$

(8) $(\frac{1}{2}n^2)\ (2n)^2(n^3)^2$

(9) $(6a^2b)\ (2ab^2)\ (ab^2)^3$

(10) $(.2a^2)\ (5a^4)^2$

(11) $(3a)^3(2ab)\ (-ab)^2$

(c) Perform the indicated operations and simplify.

(1) $(2a)^2 - 5a^2$

(2) $(x)\ (x^2) - (3x)\ (x)^2$

(3) $3a\ (2ab) - (2b)\ (-a)^2 + 4a^2b$

(4) $(-2a)\ (5b^2)\ (3a) + (7a^2)\ (3b^2) - (4ab)\ (2ab)$

V.B. (3b)

CONTENT: Polynomials; Operations on Polynomials; Laws of Exponents; Multiplication of a Polynomial by a Monomial

OBJECTIVE: The student will be able to use the laws of exponents to multiply a polynomial by a monomial.

ACTIVITIES: (a) Find the product.

(1) $-5(x^2 - 3x + 7)$

(2) $2x^2(3x - 2)$

(3) $(-x^3 + 2x^2 - 6x + 5)2x$

(4) $-a^2b\ (2a^3b - 3ab^2 + 2b^2)$

(b) Perform the indicated operations and simplify.

(1) $3(x - 2) - 4$

(2) $6x + 3\ (2x - 1) + 5$

(3) $3(4x - 3) - 3(2x + 5)$

(4) $8(x^2 - 2x - 3) - (-2x^2 + 3x - 6) + 5(-2x^2 + 6x)$

(5) $3\left\{5x + 2(2x - 3) - 6\right\}$

(6) $2x^2\ (x^2 - 3x - 6) - 4x\ (-2x^3 + 5x^2 - 2)$

V.B. (3c)

CONTENT: Polynomials; Operations on Polynomials; Laws of Exponents; Multiplication of Polynomials

OBJECTIVE: The student will be able to use the laws of exponents to multiply polynomials.

ACTIVITIES: (a) Multiply

(1) $(x + 2)\ (x - 3)$

(2) $(2x - 3)\ (4x - 2)$

(3) $(3x - 2y)\ (6x + 5y)$

(4) $(3x - 2)^2$

(5) $(5x + 2y)(5x - 2y)$

(6) $(-2x + 3)(3x - 5)$

(7) $(2x - 3)(2x^2 - 3x + 4)$

(8) $(x^2 - 5x + 3)(2x^2 + 7x - 2)$

(9) $(7x - 2x^2 + 5)(3 - x^2 + 2x)$

(10) $x(x + 2)(3x - 4)$

(11) $(a - b)(a^2 + ab + b^2)$

(b) Perform the indicated operations and simplify.

(1) $(x + 5)(x - 2) + (2x - 1)(8x + 2)$

(2) $2(3x - 2) - 3(5x + 1)(x - 1)$

(3) $(2x - 3)^2 - (x + 2)^2$

(4) $2(x - 2y)(3x + y) - 4(x + y)(x - 2y)$

V.B. (4a)

CONTENT: Polynomials; Operations on Polynomials; Laws of Exponents; Division of Monomials

OBJECTIVE: The student will be able to use the laws of exponents to divide monomials.

ACTIVITIES: (a) Find the quotient.

(1) $\frac{x^4}{x^2}$

(2) $\frac{3x^8}{x^3}$

(3) $\frac{x^{10}}{x^{12}}$

(4) $\frac{25^4y^3}{5\ xy^2}$

(5) $\frac{6x^2y^4}{12x^2y^2}$

(6) $\frac{3^6}{3^4}$

(7) $\frac{-12x^6y^{10}}{24\ x^8y^6}$

(8) $\frac{36x^6y^4z^8}{6x^2y^8z^{10}}$

(9) $\frac{16(x + y)^3}{4(x + y)^2}$

(b) Simplify each expression.

(1) $\frac{16a^5b^2}{(2ab)^3}$

(2) $\frac{(x^2y)^3}{(xy^2)^2}$

(3) $\frac{(2x^4y)^3}{(4x^3y^2)^2}$

(4) $\frac{-(3c^3d^2)^3}{6(c^2d^3)^3}$

(5) $\frac{(2x^2y)(3xy^2)}{(9x^2y^2)(2x^3y)}$

(6) $\frac{(2x^2)^2(-3x)}{(-3x^2)^2(-2x)}$

(7) $\frac{(-3xy^2)^4}{(2x^2y)^2}$

(8) $\frac{(3a)^2(-2ab)^3}{(-ab)^3(6ab)^2}$

V.B. (4b)

CONTENT: Polynomials; Operations on Polynomials; Laws of Exponents; Division of a Polynomial by a Monomial

OBJECTIVE: The student will be able to use the laws of exponents to divide a polynomial by a monomial.

ACTIVITIES: Find the quotients.

(a) $\frac{3x - 15}{3}$

(b) $\frac{8b + 4}{-2}$

(c) $\frac{5x^2 + 10x - 15}{5}$

(d) $\frac{x^2 + 8x}{x}$

(e) $\frac{4x^2 - 12x}{-2x}$

(f) $\frac{-12y^3 + 6y^2 - 8y}{-2y}$

(g) $\frac{32a^2b^3 - 16ab^4 + 8ab}{-8ab}$

(h) $\frac{4x^4 - 2x^3 + 8x^2}{-2x^2}$

V.B. (4c)

CONTENT: Polynomials; Operations on Polynomials; Laws of Exponents; Division of Polynomials

OBJECTIVE: The student will be able to use the laws of exponents to divide polynomials.

ACTIVITIES: Find the quotients.

(a) $(x^2 - 7x + 12) \div (x - 4)$

(b) $(2x^2 + 11x - 13) \div (x - 1)$

(c) $6x^2 + 5x - 6) \div (2x + 3)$

(d) $(2x^2 - xy - 6y^2) \div (x - 2y)$

(e) $(15ab + 9b^2 + 6a^2) \div (2a + 3b)$

(f) $(8a^3 + 27) \div (2a + 3)$

(g) $(12x^3 - 17x^2 + 21x - 10) \div (3x - 2)$

(h) $(6x^3 - 30x + 14x^2 + 12) \div (2x^2 + 6x - 6)$

(i) $(x^5 - 1) \div (x - 1)$

V.B. (5) CONTENT: Polynomials; Operations of Polynomials; Laws of Exponents; Zero and Negative Exponents

OBJECTIVE: The student will be able to use the laws of exponents to write equivalent expressions for monomials with a zero or negative exponent leaving answers with only positive exponents.

ACTIVITIES: Simplify. Leave answers with positive exponents.

(a) x^{-4}

(b) $\frac{x^2}{x^5}$

(c) $\frac{x^3}{x^3}$

(d) $\frac{2^3}{2^3}$

(e) $\frac{2^2}{2^5}$

*(f) $\frac{x^{-2}y}{x^{-6}y^{-7}}$

VI.A. CONTENT: Factoring Monomials; Prime Factors of Integers

OBJECTIVE: The student will be able to:

(a) Define factors,

(b) Find the prime factors of integers.

ACTIVITIES: Write each of the following as the product of primes.

(a) 12

(b) 36

(c) 250

(d) 726

(e) 768

(f) 2,000

(g) 328

(h) 1,176

*Optional

VI.B. CONTENT: Factoring Monomials; Greatest Common Factor

OBJECTIVE: The student will be able to find the greatest common factor of algebraic expressions.

ACTIVITIES: (a) Find the G. C. F. of each pair of integers.

(1) 15, 85 (4) 90, 240

(2) 84, 42 (5) 96, 56

(3) 63, 900 (6) 162, 382

(b) Find the G. C. F. of each of the following.

(1) $2x$, $4x$

(2) $16x^2y$, $8xy^3$

(3) $10x^4y^5$, $7x^3y^8$

(4) $16x^4y^4$, $32x^4y^3$

(5) $6x^2$, $9x^4y$, $3x^2y^4$

(6) $10x^2y^4$, $5xy^3$, $25x^2y^4$

VII.A. CONTENT: Multiplication and Factoring of Polynomials; Multiplying

OBJECTIVE: The student will be able to multiply binomials.

ACTIVITIES: Multiply each expression:

(a) $(a + 2)(a - 2)$

(b) $(x - 8)^2$

(c) $(2a + 3b)^2$

(d) $(-u - 6)^2$

(e) $(x + y)(x + 2y)$

(f) $(x - 5)(x + 2)$

(g) $(5h - 3)(2h + 5)$

VII.B. CONTENT: Multiplication and Factoring of Polynomials; Factoring

OBJECTIVE: The student will be able to factor special types of polynomials.

ACTIVITIES: (a) Write each expression in factored form.

(1) $2x - 4$

(2) $3x^2 - 6x$

(3) $2ax^2 - 4ax + 8a$

(4) $12c^2 - c$

(5) $5r^2s - 10rs^2$

(6) $x^3 - x^2$

(b) Factor.

(1) $x^2 - 9$

(2) $x^2 - y^2$

(3) $x^4 - y^4$

(4) $-9 + 4r^2s^2$

(c) Factor.

(1) $ax + bx + ay + by$

(2) $ab + a^2 + ab + b^2$

(d) Factor each trinomial square.

(1) $h^2 + 4h + 4$

(2) $36 - 12u + u^2$

(3) $25x^2 + 10x + 1$

(4) $4x^2 + 20xy + 25y^2$

(e) Factor each trinomial.

(1) $x^2 + 7x + 12$

(2) $x^2 - 8x + 7$

(3) $x^2 - 6x - 7$

(4) $3x^2 + 10x + 8$

(5) $3x^2 - 5x - 12$

(6) $x^2 + 14xy + 24y^2$

(7) $18x^2 - 23xy - 6y^2$

(8) $15 - 8x + x^2$

(9) $2 + 7x - 15x^2$

(f) Factor completely.

(1) $2x^2 - 8$

(2) $2x^4 - 162$

(3) $x^3 - 3x^2 - 4x$

(4) $3x^2 + 12xy + 9y^2$

(5) $18x^2 + 6xy - 4y^2$

(6) $x^4 - 13x^2 + 36$

(7) $x^3 - x^2 - 4x + 4$

VII.C. (1) CONTENT: Multiplication and Factoring of Polynomials; Quadratic Equations; Solutions by Factoring

OBJECTIVE: The student will be able to solve quadratic equations by factoring.

ACTIVITIES: Find the solution set.

(a) $x^2 - x = 6$

(b) $x^2 = 6x$

(c) $2x^2 = 8$

(d) $9x^2 - 6x + 1 = 0$

(e) $20x^2 = 22x - 6$

(f) $4x = x^2$

(g) $10x^2 = 75 - 35x$

*VII.C. (2)

CONTENT: Multiplication and Factoring of Polynomials; Quadratic Equations; Applications

OBJECTIVE: The student will be able to solve verbal problems by using quadratic equations.

ACTIVITIES: Find the solution: The length of a rectangle exceeds its width by 5 inches. If the area of the rectangle is 176 square inches, find the dimensions of the rectangle.

VIII.A

CONTENT: Fractions; Common Fractions

OBJECTIVE: The student will be able to perform fundamental operations on common fractions.

ACTIVITIES: (a) Add.

(1) $\frac{5}{6}$

$+\ \frac{2}{3}$

(2) $1\frac{1}{4}$

$+\ 2\frac{7}{8}$

(3) $76\frac{1}{10}$

$+\ 28\frac{3}{8}$

(b) Subtract.

(1) $38\frac{3}{4}$

$-\ 25\frac{1}{8}$

*Optional

(2) $56\frac{1}{9}$

$28\frac{5}{8}$

---

(3) $8\frac{5}{24}$

$2\frac{1}{18}$

(c) Find the product.

(1) $(2\frac{1}{3})\ (1\frac{1}{3})$

(2) $(1\frac{2}{5})\ (3\frac{1}{3})$

(d) Find the quotient.

(1) $(2\frac{4}{5})\ (\frac{3}{5})$

(2) $(3\frac{1}{3})\ (2\frac{2}{5})$

VIII.B (1,2)

CONTENT: Fractions; Algebraic Fractions; Definitions and Restrictions

OBJECTIVE: The student will be able to:

(a) Define an algebraic fraction;

(b) Determine the restricted values of an algebraic fraction.

ACTIVITIES: For what values of x are the fractions not defined?

(a) $\frac{1}{5x}$

(b) $\frac{x}{x - 2}$

(c) $\frac{x^2 + 4}{x^2 - 4}$

(d) $\frac{2}{x^2 - x}$

(e) $\frac{3}{x^2 + 9}$

(f) $\frac{3x}{x^2 - x - 6}$

VIII.B. (3)

CONTENT: Fractions; Algebraic Fractions; Reducing Fractions

OBJECTIVE: The student will be able to reduce algebraic fractions.

ACTIVITIES: Reduce

(a) $\frac{24x}{3xy}$

(b) $\frac{3x^2y}{6xy^2}$

(c) $\frac{a^2 - 9}{a - 3}$

(d) $\frac{x^2 - 9}{x^2 - x - 6}$

(e) $\frac{ax - ay}{bx - by}$

(f) $\frac{18x^2 - 32y^2}{6x^2 - xy - 12y^2}$

VIII.B (4,5)

CONTENT: Fractions; Algebraic Fractions; Multiplication and Division

OBJECTIVE: The student will be able to:

(a) Multiply algebraic fractions;

(b) Divide algebraic fractions.

ACTIVITIES: (a) Find the product.

(1) $\frac{-6rs}{5} \cdot \frac{10r}{3r^2s}$

(2) $\frac{x^2 - y^2}{5} \cdot \frac{5}{x-y}$

(3) $\frac{x^2 - 9}{x^2 - x} \cdot \frac{x^2 - 1}{x - 3}$

(4) $\frac{x^2 - 3x - 18}{x^2 - 9} \cdot \frac{6 - 2x}{x - 6}$

(b) Find the quotient.

(1) $\frac{3x}{5y} \div \frac{21x^2}{20y}$

(2) $\frac{2x^2 - 18}{x^2 + 6x - 7} \div \frac{8x^2 - 16x - 24}{x^2 - 1}$

(3) $\frac{x^2 - 3x + 2}{x^2 - 1} \div \frac{2 - x}{x - 1}$

(4) $\frac{5c^2 - 5cd}{cd + d^2} \div \frac{d^3 - dc^2}{cd^2}$

VIII.B. (6)

CONTENT: Fractions; Algebraic Fractions; Least Common Multiple

OBJECTIVE: The student will be able to find the least common multiple of two or more algebraic expressions.

ACTIVITIES: Find the L. C. M. of:

(a) 8 and 12

(b) 6a and 2a

(c) $12x^2y$ and $18\ xy^2$

(d) $x^2 - 1$ and $3x + 3$

(e) $x^2 - 3x + 2$ and $x - 2$

VIII.B (7)

CONTENT: Fractions; Algebraic Fractions; Combining Fractions

OBJECTIVE: The student will be able to combine fractions by addition and subtraction.

ACTIVITIES: Perform the indicated operations.

(a) $\frac{3}{x} + \frac{5}{x}$

(b) $\frac{2x}{x-1} - \frac{2}{x-1}$

(c) $\frac{3}{xy^2} - \frac{2}{x^2y}$

(d) $\frac{5}{x-y} - \frac{3}{y-x}$

(e) $\frac{3}{2a} - \frac{3-a}{6-a}$

(f) $\frac{6}{a+b} - \frac{4}{3a^2 - 3b^2}$

(g) $\frac{3a-4}{a^2-9} - \frac{2a-3}{a^2-a-6}$

VIII.B. (8)

CONTENT: Fractions; Algebraic Fractions; Mixed Expressions

OBJECTIVE: The student will be able to simplify mixed expressions by adding a polynomial and a fraction.

ACTIVITIES: Perform the indicated operations.

(a) $5 + \frac{5}{y}$

(b) $a + 1 + \frac{1}{a+1}$

(c) $x - 5 - \frac{x}{x+3}$

*VIII.B (9)

CONTENT: Fractions; Algebraic Fractions; Complex Fractions

OBJECTIVE: The student will be able to simplify complex fractions.

ACTIVITIES: Simplify.

(a) $\dfrac{1 + \frac{1}{x}}{1 - \frac{1}{x}}$

(b) $\dfrac{\frac{a - b}{a}}{a - \frac{b}{a}}$

(c) $\dfrac{\frac{1}{a} + \frac{1}{b}}{\frac{a + b}{ab}}$

(d) $\dfrac{1 - \frac{r^2}{s^2}}{1 - \frac{2r}{s} + \frac{r^2}{s^2}}$

VIII.C.

CONTENT: Fractions; Fractional Equations

OBJECTIVE: The student will be able to solve fractional equations.

ACTIVITIES: Find the solution set.

*Optional

(a) $\frac{x}{2} + \frac{x}{3} = 40$

(b) $\frac{7x + 5}{8} - \frac{8x + 15}{10} = 2$

*VIII.D. CONTENT: Fractions; Fractional Inequalities

OBJECTIVES: The student will be able to solve first degree fractional inequalities.

ACTIVITIES: Find the solution set.

(a) $\frac{x}{9} - \frac{x}{4} > \frac{5}{36}$

(b) $\frac{5x}{2} - x < \frac{3}{2}$

*VIII.E. CONTENT: Work and Motion Problems

OBJECTIVES: The student will be able to solve work and motion problems using fractional equalities.

ACTIVITIES: Solve the following problems:

(a) Jack can mow the lawn in 3 hours. Jan can mow the lawn in 2 hours. How long would it take them to complete the job working together?

(b) Yvonne drove her speedboat to Ship Island. It took her 1 hour longer to go than to return. If the rate going was 30 mph and the rate returning was 40 mph, how long did the entire trip take and what was the total distance traveled?

IX.A,B. (1) CONTENT: Linear Equations and Inequalities; Terminology; Graphing; Location of Points

OBJECTIVE: The student will be able to:

(a) Identify the mathematical terms listed on page 14.

(b) Locate and relate points in a plane to ordered pairs of numbers.

*Optional

ACTIVITIES: (a) Graph each ordered pair.

(1) (-2,0)

(2) (-3,2)

(3) (6,0)

(4) (2,4)

(5) (0,-2)

(6) (0,-3)

(7) (3,-4)

(b) Which of the points identified in part (a) do not lie in any quadrant?

IX.B. (2)

CONTENT: Linear Equations and Inequalities; Graphing; Linear Equations

OBJECTIVE: The student will be able to graph linear equations in two variables.

ACTIVITIES: Draw a coordinate system and graph.

(a) $x = 2$

(b) $y = -3$

(c) $2x + y = 4$

(d) $3x - 2y = -6$

(e) $-5y = -x + 10$

IX.B. (3)

CONTENT: Linear Equations and Inequalities; Graphing, Linear Inequalities

OBJECTIVE: The student will be able to graph linear inequalities in two variables.

ACTIVITIES: Draw a coordinate system and graph the solution set.

(a) $x \geq 2$

(b) $y \leq -1$

(c) $x > -1$ and $y < -2$

(d) $x + 2y \leq 6$

(e) $x - 3y > 2$

*(f) $2x - y \leq 2$ and $x + y > -4$

IX.C. **CONTENT:** Linear Equations and Inequalities; Slope of a Line; Computation of a Slope

OBJECTIVE: The student will be able to find the slope of a line given:

(a) The graph of a line,

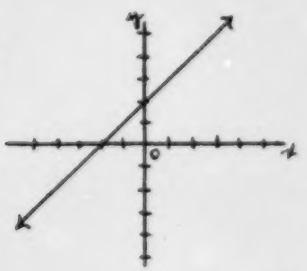
(b) The coordinates of two points of a line, and

(c) An equation of the line.

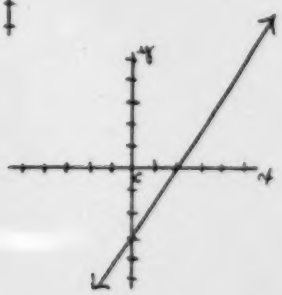
ACTIVITIES: Find the slope of each line.

(a)

(1)



(2)



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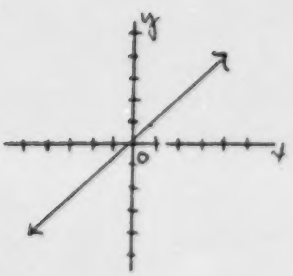
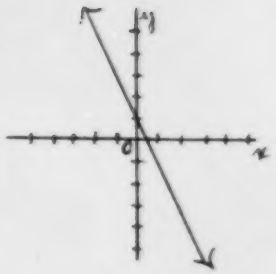


*Optional

(4) 

(b) Find the slope of the line that contains:

(1) (7,-1) and (2,3)

(2) (7,-6) and (2,-6)

(3) (5,-2) and (5,4)

(4) (4,1) and (2,-6)

(5) (-8,-2) and (-3,-5)

(c) Write each equation in the form $y = mx + b$. Find the slope of the line.

(1) $2x + y = 3$

(2) $x + 2y = 13$

(3) $3x - 2y = 6$

(4) $7x - 8y = 15$

(5) $2y = 6$

IX.D. (1)

CONTENT: Linear Equations and Inequalities; Equations of a Line; Slope-Intercept Form

OBJECTIVE: The student will be able to find equations of lines in slope-intercept form.

ACTIVITIES: (a) Find an equation of the line given that:

(1) $m = 3$; $b = 2$

(2) $m = \frac{2}{3}$; $b = -5$

(3) $m = 0$; $b = -2$

(4) $m = -\frac{3}{5}$; $b = 6$

(b) Find an equation of the line that contains P and has slope m as indicated.

(1) P(2, -2); m = 3

(2) P(-3, 5); m = $\frac{2}{3}$

(c) Find an equation of the line that contains:

(1) (1, 4) and (4, 3)

(2) (0, 5) and (-3, 0)

(3) (-3, -2) and (5, -4)

IX.D (2)

CONTENT: Linear Equations and Inequalities; Equations of a Line; Point-Slope Form

OBJECTIVE: The student will be able to find equations of lines in point-slope form.

ACTIVITIES: (a) Find the slope of the indicated line and the coordinates of a point on the line.

(1) $(y - 2) = \frac{2}{3}(x - 2)$

(2) $3(y - 2) = x - 7$

(b) Find an equation of the line that contains:

(1) (1, 4) and (4, 3)

(2) (-1, 1) and (1, -1)

(3) (2, -3) and (4, -1)

(c) Find an equation of the line that contains P and has the given slope.

(1) P(-2, 3); m = -4

(2) P(-2, 7); m = $\frac{3}{4}$

IX.E. (1)

CONTENT: Linear Equations and Inequalities; Systems of Linear Equations; Graphing

OBJECTIVE: The student will be able to solve systems of linear equations by graphing.

ACTIVITIES: Find the point of intersection of the graphs of:

(a) $y = 2x + 4$
$x = y - 5$

(b) $x + y = 3$
$2x - y = -9$

IX.E. (2,3)

CONTENT: Linear Equations and Inequalities; Systems of Linear Equations; Linear-Combination Method

OBJECTIVE: The student will be able to solve systems of linear equations by addition, subtraction, or substitution.

ACTIVITIES: Find the solution set of each system of equations.

(a) $x + 2y = 8$
$x - 2y = 4$

(b) $a + b = 11$
$3a - 2b = 8$

(c) $5x + 3y = 17$
$4x - 5y = 21$

(d) $3x = 13 - 2y$
$\frac{3y + x}{2} = 8$

*IX.E. (4)

CONTENT: Linear Equations and Inequalities; Systems of Linear Equations; Applications

OBJECTIVE: The student will be able to solve verbal problems by using systems of equations.

ACTIVITIES: (a) Digit problems

(1) The tens digit in a two-digit number is 2 more than twice the units digit. The sum of the digits is 11. Find the number.

(2) The units digit of a two-digit number is 11 less than twice the tens digit. The number is 6 less than 7 times the sum of the digits. Find the number.

*Optional

(b) Dry Mixture

(1) How many pounds of 90¢ candy must be added to 20 pounds of 75¢ candy to make a mixture of 85¢ candy?

(2) A company has two brands of tea. Brand A is worth $.90 a pound and Brand B is worth $1.20 a pound. How many pounds of each brand must be mixed to make a blend of 100 pounds of tea that is worth $1.00 a pound.

(c) Distance Problems

(1) A plane that can fly 275 mph in still air flys 3 hours against the wind and two hours with the wind. The total distance it travels is 1,300 miles. Find the wind speed.

(2) A boat travels 18 miles downstream in 2 hours. It requires 6 hours to travel back to the same point upstream. Find the rate of the boat in still water and the rate of the current.

(d) Wet Mixture

(1) A lab technician has solutions of 40% alcohol and 60% alcohol. He needs 100 liters of a solution that is 48% alcohol. How many liters of each solution should he mix?

(2) How many pints of 15% vinegar solution should be added to 10 pints of 20% vinegar solution to yield a solution that is 18% vinegar?

*IX.F. CONTENT: Linear Equations and Inequalities; Systems of Linear Inequalities; Graphing

OBJECTIVE: The student will be able to determine the solution set of two or more linear inequalities by graphing.

ACTIVITIES: Find the solution set of each of the following by graphing.

*Optional

(a) $2x + 3y \geq 6$ and $x + y - 4 \leq 0$

(b) $y - 2x > 2$ or $x + y \leq 2$

(c) $x \geq 4$ and $2x - y < 4$

X.A.,B. CONTENT: Real Numbers, Radicals and Quadratics; Real Numbers

OBJECTIVE: The student will be able to define and/or identify the listed mathematical terms.

ACTIVITIES: (a) Which of the following are true?

(1) Zero is a rational number.

(2) There is no least real number.

(3) The number $\frac{22}{7}$ is not rational.

(4) $\sqrt{2}$ is not real.

(5) .1313... is rational.

(6) .2020020002... is rational.

(b) Name a real number that is not rational.

(c) Name a rational number that is non-negative.

X.C. CONTENT: Introduction to Squares and Square Roots; Square Roots

OBJECTIVE: The student will be able to:

(a) Find the square root of a perfect square.

(b) Simplify monomial square roots.

ACTIVITIES: (a) Find the square root of a perfect square.

(1) $\sqrt{64}$

(2) $\sqrt{625}$

(3) $\sqrt{121}$

(4) $\sqrt{169}$

(5) $\sqrt{x^6}$

(6) $\sqrt{25x^{10}y^{12}}$

(7) $\sqrt{32^2}$

(8) $\sqrt{1/9}$

(b) Simplify monomial square roots.

(1) $\sqrt{20}$

(2) $\sqrt{96}$

(3) $\sqrt{x^7}$

(4) $\sqrt{12x^3}$

(5) $\sqrt{36x^5y^6}$

(6) $\sqrt{\frac{a^3}{64}}$

X.D.
(1)

CONTENT: Real Numbers, Radicals and Quadratics; Radical Expressions; Properties of Radicals

OBJECTIVE: The student will be able to identify and use the properties of radicals.

ACTIVITIES: Perform the indicated operations.

(a) $\sqrt{5} \cdot \sqrt{5}$

(b) $\sqrt{32} \cdot \sqrt{2}$

(c) $(\sqrt{3})^2$

(d) $\frac{\sqrt{48}}{\sqrt{3}}$

(e) $\frac{\sqrt{27}}{\sqrt{3}}$

(f) $(2\sqrt{2})(3\sqrt{8})$

(g) $\frac{\sqrt{75x^3}}{\sqrt{3x}}$

X.D. (2,3)

CONTENT: Real Numbers, Radicals and Quadratics, Radical Expressions; Computations with Radicals

OBJECTIVE: The student will be able to:

(a) Multiply and divide radical expressions.

(b) Add and subtract radical expressions.

(c) Rationalize the denominator of fractions.

ACTIVITIES: (a) Perform the indicated operations.

(1) $(\sqrt{9a})\ (\sqrt{ab})$

(2) $(\sqrt{3a})^2$

(3) $(5\sqrt{3x})^2$

(4) $(3\sqrt{2})\,(4\sqrt{8})$

(5) $(\sqrt{6xy})\,(\sqrt{4x^3y^2})$

(6) $(\sqrt{27x})\,(\sqrt{2x})$

(7) $(4\sqrt{56})\,(2\sqrt{\frac{1}{2}})$

(8) $\sqrt{18} \div \sqrt{2}$

(9) $3\sqrt{48} \div 2\sqrt{3}$

(10) $\dfrac{\sqrt{8x^3}}{2\sqrt{2x}}$

(b) Perform the indicated operations and simplify.

(1) $8\sqrt{2} + 6\sqrt{2}$

(2) $3\sqrt{8} + 2\sqrt{2}$

(3) $4\sqrt{27} - 2\sqrt{3} + 5\sqrt{12}$

(4) $15\sqrt{x^2y} - 6x\sqrt{4y}$

(5) $3\sqrt{2} + \sqrt{18} + 5\sqrt{8}$

(c) Simplify.

(1) $\frac{8}{2\sqrt{2}}$

(2) $\frac{\sqrt{7} - 2}{\sqrt{7}}$

(3) $\frac{4}{\sqrt{3} - 1}$

(4) $\frac{\sqrt{3} + \sqrt{7}}{\sqrt{3} + \sqrt{2}}$

(d) Find the product.

(1) $(3\sqrt{2} - 3)(2\sqrt{2} + 5)$

(2) $(3\sqrt{2} - 2\sqrt{3})^2$

(3) $(5\sqrt{5} + 2\sqrt{2})(5\sqrt{5} - 2\sqrt{2})$

X.E. (1)

CONTENT: Real Numbers, Radicals and Quadratics; Quadratic Equations; Solutions of Quadratic Equations

OBJECTIVE: The student will be able to solve quadratic equations by:

(a) Factoring,

(b) Using the quadratic formula, and

*(c) Completing the square,

ACTIVITIES: (a) Solve by factoring.

(1) $x^2 = 16$

(2) $2x^2 = 6x$

(3) $x^2 - 8x + 12 = 0$

(4) $y^2 - y = 72$

(5) $10x^2 + 11x = 6$

(6) $x^2 - 25 = 0$

*Optional

(b) Solve for x.

(1) $(x - 1)^2 = 4$

(2) $(x + 2)^2 = 9$

(3) $(x - \frac{3}{2})^2 = \frac{25}{4}$

(4) $(x + \frac{5}{4})^2 = \frac{25}{16}$

*(c) Solve by completing the square.

(1) $x^2 + 2x = 8$

(2) $3x^2 = 5x + 2$

(3) $x^2 - 3x - 4 = 0$

(d) Solve the exercises of part (a) and part (c) by using the quadratic formula.

X.E. (2)

CONTENT: Real Numbers; Radicals and Quadratics; Quadratic Equations; Applications

OBJECTIVE: The student will be able to solve verbal problems whose solutions involve quadratic equations.

ACTIVITIES: Solve the following.

(a) The square of a certain number exceeds the number by 72. Find the number.

(b) If 5 times the square of a number is decreased by twice the number, the result is 16. Find the number.

(c) The length of a rectangle is twice its width. If the area of the rectangle is 72 square inches find the dimensions of the rectangle.

*X.F.

CONTENT: Real Numbers; Radicals and Quadratics; Radical Equations

OBJECTIVE: The student will be able to solve radical equations

ACTIVITIES: Solve for x.

*Optional

(a) $4\sqrt{3x} = 9$

(b) $\sqrt{x+3} = 5$

(c) $\sqrt{2x - 4} = 10$

*X.G. CONTENT: Real Numbers, Radicals and Quadratics; Quadratic Inequalities

OBJECTIVE: The student will be able to solve quadratic inequalities.

ACTIVITIES: Find the solution set.

(a) $x^2 - 5x + 6 > 0$

(b) $2x^2 - 9x + 10 \leq 0$

(c) $x^2 + 7x < 0$

*XI.A. CONTENT: Relations and Functions; Relations; Definitions; Domain and Range

OBJECTIVE: The student will be able to:

(a) Define a relation,

(b) Recognize a relation, and

(c) Determine the domain and range of a relation.

ACTIVITIES: Identify the domain and range of the following relations.

(a) $\{(1,2), (-3,4), (-3,2), (0,1)\}$

(b) $\{(x,y) | \ y = 2x, \ x \text{ any real number}\}$

(c) $\{(x,y) | \ y = x^2, \ x \text{ any real number}\}$

(d) $\{(x,y) | \ y = |x|, \ x \text{ any real number}\}$

(e) $\{(x,y) | \ y = 2x + 1, \ x \text{ any integer}\}$

*Optional

*XI.B. (1,2,3)

CONTENT: Relations and Functions; Functions; Definitions; Domain and Range

OBJECTIVE: The student will be able to:

(a) Define a function,

(b) Recognize a function, and

(c) Determine the domain and range of a function.

ACTIVITIES: (a) Consider the following relations.

$A = \{(1, 2), (2, 3), (0, 1)\}$

$B = \{(1, 0), (2, 1), (3, 2), (2, 2)\}$

$C = \{(x, y) \mid y = 2x, x \text{ any real number}\}$

$D = \{(x, y) \mid x = y^2, x \text{ a whole number}\}$

(1) Which of the above illustrate functions?

(b) Define a function whose domain is {reals} and whose range is {non-negative reals}.

*XI.B. (4)

CONTENT: Relations and Functions; Functions; Functional Notation

OBJECTIVE: The student will be able to find elements of the range of a function by using functional notation.

ACTIVITIES: (a) Given $f(x) = x^2 + 2x$ find

(1) $f(1)$

(2) $f(-3)$

(3) $f\left(\frac{1}{2}\right)$

(4) $f(p)$

(5) $f(x + 1)$

(6) $f(x^2)$

*Optional

(b) Given that $f(x) = 2x + 3$ and $g(x) = \frac{x-3}{2}$ find

(1) $f(3)$

(2) $g(2)$

(3) $f\{g(1)\}$

(4) $g\{f(-2)\}$

(5) $f\{g(x)\}$

(6) $g\{f(x)\}$

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AND

ADDITIONAL RESOURCES

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EVALUATION TECHNIQUES

EVALUATION TECHNIQUES

The importance of regular and frequent evaluation is nowhere more obvious than in the area of mathematics where skills are built in a cumulative manner. Frequent short quizzes should be used to determine understanding and mastery of each concept as it is taught. Longer tests covering related concepts and their relevance in problem solving should be administered at the conclusion of each unit of learning. Comprehensive examinations covering all concepts and skills are very important at the end of each semester or each year. The sample items in the activities section of this guide represent ideas for examination problems but are by no means recommended for use as they are presented in this book. These evaluative techniques are to be used to measure the degree of achievement by the students with the understanding that there are many other types of tools for the measurement of student progress in achieving curricular objectives.

A basic goal in teaching mathematics should be to aid the student in becoming a competent problem solver. It is not enough to teach just mathematical skills. The student must also be provided an opportunity to practice the application of these mathematical skills to successfully solve problems. The student's ability to solve problems logically should be evaluated regularly since it is a lifetime skill which carries over into all areas of living.

ANSWER KEY

ALGEBRA I

ALGEBRA I ANSWER KEY TO THE ACTIVITIES

I.A. page 20

(a) plus, equal
(b) minus
(c) multiplication (times)
(d) divided by
(e) greater than
(f) greater than or equal to
(g) less than
(h) less than or equal to
(i) parenthesis, plus, divided by
(j) braces, minus, divided by

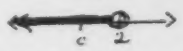
I.B.(1,2) page 20

(A) 4
(B) 2
(C) 3
(D) 5
(E) 6
(F) 1

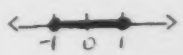
I.C. page 21

(1 & 2) (a)

(b)



(c)



(3) (a) <
(b) <
(c) <
(d) >
(e) >
(f) >
(g) =

I.C.(4) page 21

(a) 7
(b) 4
(c) 17
(d) 5
(e) -6
(f) -n
(g) n
(h) -n

II.A. page 22

(a) (1) 26
(2) 3
(3) 4
(4) 40
(5) 4
(b) (1) 17
(2) $9\frac{1}{2}$
(3) 2
(4) 28
(5) 22
(6) 18

II.B.(1,2) page 23

(a) (1) 5
(2) -5
(3) -12
(4) 2
(b) (1) 10
(2) -1
(3) -28
(4) 17
(5) -10
(6) $\frac{1}{6}$

II.C. page 23

(a) (1) 2
(2) -9
(3) -4
(4) -40
(5) 3
(b) (1) 2
(2) -11
(3) -4
(4) 28

II.D page 24

(a) -20
(b) 12
(c) -18
(d) $-\frac{1}{3}$
(e) 30
(f) -60

II.E. page 24

(a) -1
(b) -4
(c) 2
(d) $-\frac{1}{2}$
(e) -4
(f) $-\frac{8}{3}$ or $-2\frac{2}{3}$

II.F. page 25

(a) (1) Commutative
(2) Commutative
(3) Distributive
(4) Addition of 0
(5) Distributive
(6) Associative
(7) Opposites
(8) Multiplicative of 1
(9) Multiplicative of 1
(10) Multiplicative of 0
(11) Associative
(12) Reciprocals
(13) Commutative
(14) Commutative
(15) Commutative

(b) (1) Associative; Commutative
(2) Associative; Closure
(3) Associative; Closure
(4) Distributive; Multiplication of 0; Additive of 0

III.A. page 26

(a) (1) 9
(2) -15
(3) 16
(4) 1
(5) $\frac{3}{21}$ or $\frac{1}{7}$
(6) 49
(7) 25
(8) -22

(b) (1) $\{5,8,9,12\}$
(2) $\{-3,0,5,8\}$

III.B.(1,2) page 27

(a) R
(b) T
(c) S

III.B.(3,4) page 27

(a) $\{16\}$
(b) $\{12\}$
(c) $\{-9\}$
(d) $\{+18\}$
(e) $\{16\}$
(f) $\{-27\}$
(g) $\left\{-\frac{10}{3}\right\}$ or $\left\{-3\frac{1}{3}\right\}$
(h) $\{5\}$
(i) $\{-9\}$
(j) $\{-4\}$
(k) $\{-4\}$

III.B.(5) page 28

(a) $\{7,-7\}$
(b) $\{6,-6\}$
(c) $\{4\}$
(d) $\{2,-6\}$

III.C.(1,2,3,4) page 28

(a) $x > 6$
(b) $y \geq 3$
(c) $s > -3$
(d) $p > 4$
(e) $x \leq -6$
(f) $x \leq -\frac{3}{2}$
(g) $p > -3$
(h) $x > 0$

III.C.(5,6) page 29

(a) $-6 \leq y < -1$
(b) $-2\frac{1}{2} < b < -1$
(c) $m > 2$ or $m < -1$
(d) $m < 7$ and $m > 1$
(e) $x < -1$ or $x < 3$
(f) $x > 0$ and $x \leq 2$
(g) $3 \leq a < 4$
(h) $x > 3$ and $x > -2$
(i) $x > 6$ or $x < 2$
(j) $-5 \leq x \leq 1$

IV.A. page 29

(a) (1) $\{2\}$
(2) $\{-10\}$
(3) $\{6\}$
(4) $\{11\}$
(5) $\{4\}$
(6) $\{60\}$
(7) $\left\{\frac{83}{17}\right\}$ or $\left\{4\frac{15}{17}\right\}$
(8) $\left\{\frac{5}{4}d\right\}$
(9) $\left\{\frac{2m}{c}\right\}$
(10) $\{ab - a^2\}$

(b) (1) $\{16\}$
(2) $\{-12\}$
(3) $\{-17\}$
(4) $\{-1\}$
(5) $\left\{-\frac{5}{3}\right\}$

IV.B. page 30

(a) $x < 9$
(b) $x < 6$
(c) $x \geq -2$
(d) $x \leq -6$

IV.C. page 31

(a) $b + 8$
(b) $x - y$
(c) $S(t)$
(d) $12 + 8$
(e) $d - 5$
(f) $2c + 5$
(g) $2m - 6$
(h) $7 - (2 + c)$
(i) $5(2 + y)$
(j) $(3x)^2$
(k) $(3 + x)^2$

IV.D. page 31

(a) (1) $\{35\}$
(2) $\{63\}$

(b) (1) $\{17,18\}$
(2) $\{33,35,37\}$
(3) $\{11,13,15\}$

(c) (1) $\{l=25, w=17\}$
(2) $\{10,14,8\}$

(d) (1) 6 hours
(2) r_f = 45 mph
r_t = 60 mph

(e) (1) 9 dimes
(2) 28 weeks

(f) (1) $\{11,22,27\}$
(2) $\{10\}$

V.A.(1,2) page 33

(a) (1) B; 2,6; 3
(2) T; 3,-6, 8;2
(3) T; 1,-1,1;4
(4) B; 6,1; 5
(5) M; 7; 0
(6) B; -5,6;1

(b) (1) $6x^3 + 5x^2 + 4x - 5$
(2) $3x^8 - 7x^4 + x^2 - 6$
(3) $2p^5 - p^4 + p^3 - p^2 + 2p - 1$
(4) $-3c^4 + 2c^3d + 3c^2d^2 + 4d^3 - 5$

V.B.(1) page 34

(a) $6x^3 + 8x^2 - 10$
(b) $-2x^2y - 4xy^2$
(c) $5x^2 - 6x$
(d) $-2x^2 - 6x - 2$
(e) $x^4 - 3x^3 - 11x^2 + 7$
(f) $3a^3b + 5a^2b^2 - 4ab^2$

V.B.(2) page 34

(a) (1) $-11x^2 + 5x + 2$
(2) $11a + 9b + 4c$
(3) $x^3 - 1x^2 - 5x - 2$
(4) $8x^3 - 2x^2 + 2x + 11$

(b) (1) $3x + 3$
(2) $13x^2 + 4x - 7$
(3) $-12x^3 + 5x^2 - 6x + 2$
(4) $2x^2 - 8x - 2$

V.B.(3a) page 35

(a) (1) a^5
(2) $6x^2y^4$
(3) a^6
(4) s^7
(5) $27x^2y^2$
(6) $-8a^3b^4$
(7) $16r^7s^4$
(8) $-12a^4b^4$
(9) $-2r^8s^7$

(b) (1) x^6
(2) x^6
(3) $9a^2$
(4) $-8a^6$
(5) $12a^2$
(6) $36x^4$
(7) $16x^4$
(8) $2n^{10}$
(9) $12a^6b^9$
(10) $5a^{10}$
(11) $54a^6b^3$

(c) (1) $-1a^2$
(2) $-2x^3$
(3) $8a^2b$
(4) $-17a^2b^2$

V.B.(3b) page 36

(a) (1) $-5x^2 + 15x - 35$
(2) $6x^3 - 4x^2$
(3) $-2x^4 + 4x^3 - 12x^2 + 10x$
(4) $-2a^5b^2 + 3a^3b^3 - 2a^2b^3$

(b) (1) $3x - 10$
(2) $12x + 2$
(3) $6x - 24$
(4) $11x - 18$
(5) $27x - 36$
(6) $10x^4 - 26^3 - 12x^2 + 8x$

V.B.(3c) page 37

(a) (1) $x^2 - x - 6$
(2) $8x^2 - 16x + 6$
(3) $18x^2 + 3xy - 10y^2$
(4) $9x^2 - 12x + 4$
(5) $25x^2 - 4y^2$
(6) $-6x^2 + 19x - 15$
(7) $4x^3 - 12x^2 + 17x - 12$
(8) $2x^4 - 3x^3 + 31x^2 + 31x - 6$
(9) $2x^4 - 11x^3 + 3x^2 + 31x + 15$
(10) $3x^3 + 2x^2 - 8x$
(11) $a^3 - b^3$

(b) (1) $17x^2 - x - 12$
(2) $-15x^2 + 18x - 1$
(3) $3x^2 - 16x + 5$
(4) $2x^2 - 6xy + 4y^2$

V.B. page 37

(a) (1) x^2
(2) $3x^5$
(3) $\frac{1}{x^2}$ or x^{-2}
(4) $5x^3y$
(5) $\frac{y^2}{2}$
(6) 3^2 or 9
(7) $\frac{-y^4}{2x^2}$
(8) $\frac{6x^4}{y^4z^2}$
(9) $4(x + y)$ or $4x + 4y$

(b) (1) $\frac{2a^2}{b}$
(2) $\frac{x^4}{y}$
(3) $\frac{x^6}{2y}$
(4) $\frac{-9c^3}{2d^3}$
(5) $\frac{1}{3x^2}$
(6) $\frac{2}{3}$
(7) $\frac{81y^6}{4}$
(8) $\frac{2}{b^2}$

V.B.(4b) page 39

(a) $x - 5$
(b) $-4b - 7$
(c) $x^2 + 2x - 3$
(d) $x + 8$
(e) $-2x + 6$
(f) $6y^2 - 3y + 4$
(g) $-4ab^2 + 2b^3 - 1$
(h) $-2x^2 + x - 4$

V.B.(4c) page 39

(a) $x - 3$
(b) $2x + 13$
(c) $3x - 2$
(d) $(2x + 3y)$
(e) $3a + 3b$ or $3(a + b)$
(f) $4a^2 - 6a + 9$
(g) $4x^2 - 3x + 5$
(h) $3x - 2$
(i) $x^4 + x^3 + x^2 + x + 1$

V.B.(5) page 40

(a) $\frac{1}{x^4}$
(b) $\frac{1}{x^3}$
(c) 1
(d) 1
(e) $\frac{1}{2^3}$ or $\frac{1}{8}$
(f) $x^4 y^8$

VI.A. page 40

(a) $2^2 \cdot 3$
(b) $2^2 \cdot 3^2$
(c) $2 \cdot 5^3$
(d) $2 \cdot 3 \cdot 11^2$
(e) $2^8 \cdot 3$
(f) $2^4 \cdot 5^3$
(g) $2^3 \cdot 41$
(h) $2^3 \cdot 3 \cdot 7^2$

VI.B. page 41

(a) (1) 5
(2) 42
(3) 9
(4) 30
(5) 8
(6) 2

(b) (1) $2x$
(2) $8xy$
(3) $x^3 y^5$
(4) $16 x^4 y^3$
(5) $3x^2 y$
(6) $5xy^3$

VII.A. page 41

(a) $a^2 - 4$
(b) $x^2 - 16x + 64$
(c) $4a^2 + 12ab + 9b^2$
(d) $u^2 + 12u + 36$
(e) $x^2 + 3xy + 2y^2$
(f) $x^2 - 3x - 10$
(g) $10h^2 + 19h - 15$

VII.B. page 42

(a) (1) $2(x - 2)$
(2) $3x(x - 2)$
(3) $2a(x^2 - 2x + 4)$
(4) $c(12c - 1)$
(5) $5rs(r - 2s)$
(6) $x^2(x - 1)$

(b) (1) $(x - 3)(x + 3)$
(2) $(x - y)(x + y)$
(3) $(x^2 + y^2)(x - y)(x + y)$
(4) $(2rs - 3)(2rs + 3)$

(c) (1) $(x + y)(a + b)$
(2) $(a + b)^2$

(d) (1) $(h + 2)^2$
(2) $(u - 6)^2$
(3) $(5x + 1)^2$
(4) $(2x + 5y)^2$

(e) (1) $(x + 4)(x + 3)$
(2) $(x - 1)(x - 7)$
(3) $(x - 7)(x + 1)$
(4) $(3x + 4)(x + 2)$
(5) $(3x + 4)(x - 3)$
(6) $(x + 12y)(x + 2y)$
(7) $(9x + 2y)(2x - 3y)$
(8) $(x - 3)(x - 5)$
(9) $-1(3x - 2)(5x + 1)$

(f) (1) $2(x - 2)(x + 2)$
(2) $2(w^2 + 9)(w + 3)(w - 3)$
(3) $x(x - 4)(x + 1)$
(4) $3(x + 3y)(x + y)$
(5) $2(3x + 2y)(3x - y)$
(6) $(x + 3)(x - 3)(x + 2)(x - 2)$
(7) $(x - 1)(x + 2)(x - 2)$

VII.C.(1) page 43

(a) $\{3,-2\}$

(b) $\{0,6\}$

(c) $\{2,-2\}$

(d) $\left\{\frac{1}{3}\right\}$

(e) $\left\{\frac{3}{5},\frac{1}{2}\right\}$

(f) $\{0,4\}$

(g) $\left\{\frac{3}{2},-5\right\}$

VII.C.(2) page 44

(a) $w = 11$
$l = 16$

VIII.A. page 44

(a) (1) $\frac{9}{6}$ or $\frac{3}{2}$

(2) $4\frac{1}{8}$

(3) $104\frac{19}{40}$

(b) (1) $13\frac{5}{8}$

(2) $27\frac{35}{72}$

(3) $6\frac{11}{72}$

(c) (1) $\frac{28}{9}$ or $3\frac{1}{9}$

(2) $\frac{14}{3}$ or $4\frac{2}{3}$

(d) (1) $\frac{14}{3}$ or $4\frac{2}{3}$

(2) $\frac{25}{18}$ or $1\frac{7}{18}$

VIII.B.(1,2) page 45

(a) $x = 0$

(b) $x = 2$

(c) $x = 2, -2$

(d) $x = 0, 1$

(e) defined for all real numbers

(f) $x = 3, -2$

VIII.B.(3) page 46

(a) $\frac{8}{y}$

(b) $\frac{x}{2y}$

(c) $a + 3$

(d) $\frac{x + 3}{x + 2}$

(e) $\frac{a}{b}$

(f) $\frac{2(3x - 4y)}{(2x - 3y)}$

VIII.B.(4,5) page 46

(a) (1) -4

(2) $x + y$

(3) $\frac{(x + 3)(x + 1)}{x}$

(4) -2

(b) (1) $\frac{4}{7x}$

(2) $\frac{x + 3}{4(x + 7)}$

(3) $\frac{-1(x - 1)}{(x + 1)}$

(4) $\frac{-5c^2}{(c + d)^2}$

VIII.B.(6) page 47

(a) 24

(b) $6a$

(c) $36x^2y^2$

(d) $3(x - 1)(x + 1)$

(e) $(x - 2)(x - 1$

VIII.B.(7) page 47

(a) $\frac{8}{x}$

(b) 2

(c) $\frac{3x - 2y}{x^2y^2}$

(d) $\frac{8}{x - y}$

(e) $\frac{2a^2 - 9a + 18}{2a(6 - a)}$

(f) $\frac{2(9a - 9b - 2)}{3(a + b)(a - b)}$

(g) $\frac{a^2 - a + 1}{(a - 3)(a + 3)(a + 2)}$

VIII.B.(8) page 48

(a) $\frac{5(y + 1)}{y}$

(b) $\frac{a^2 + 2a + 2}{a + 1}$

(c) $\frac{x^2 - 3x - 15}{x + 3}$

VIII.B.(9) page 48

(a) $\frac{x + 1}{x - 1}$

(b) $\frac{a - b}{a^2 - b}$

(c) 1

(d) $\frac{s + r}{s - r}$

VIII.C. page 49

(a) $\{48\}$

(b) $\left\{\frac{115}{3}\right\}$

VIII.D. page 49

(a) $x < -1$

(b) $x < 1$

VIII.E. page 49

(a) 1 1/5 hours

(b) 7 hours; 240 minutes

IX.A.,B.(1) page 50

(a) teacher corrected

(b) (-2,0); (6,0)
(0,-2); (0,-3)

IX.B.(2) page 50

(a)-(e) individual graphs

IX.B.(3) page 50

(a)-(f) individual graphs

IX.C. page 51

(a) (1) 1

(2) $\frac{3}{2}$

(3) -1

(4) -2

(b) (1) $-\frac{4}{5}$

(2) 0

(3) no slope

(4) $\frac{7}{2}$

(5) $-\frac{3}{5}$

(c) (1) $y = -2x + 3$ $\quad m = -2$

(2) $y = \frac{-1}{2}x + \frac{13}{2}$ $\quad m = -\frac{1}{2}$

(3) $y = \frac{3}{2}x - 3$ $\quad m = \frac{3}{2}$

(4) $y = \frac{7}{8}x - \frac{15}{8}$ $\quad m = \frac{7}{8}$

(5) $y = 3$ $\quad m = 0$

IX.D.(1) page 52

(a) (1) $y = 3x + 2$

(2) $y = \frac{2}{3}x - 5$

(3) $y = -2$

(4) $y = -\frac{3}{5}x + 6$

(b) (1) $y = 3x - 8$

(2) $y = \frac{2}{3}x + 7$

(c) (1) $y = \frac{-1}{3}x + 4\frac{1}{3}$

(2) $y = \frac{5}{3}x + 5$

(3) $y = -\frac{1}{4}x - 2\frac{3}{4}$

IX.D.(2) page 53
Answers will vary.

(a) (1) $m = \frac{2}{3}$

(2) $M = \frac{1}{3}$

(b) (1) $(y - 4) = \frac{-1}{3}(x - 1)$

(2 $(y - 1) = -1(x + 1)$

(3) $(y + 3) = 1(x - 2)$

(c) (1) $(y - 3) = -4(x + 2)$

(2) $(y - 7) = \frac{3}{4}(x + 2)$

IX.E.(1) page 54
(a) (1,6)
(b) (-2,5)

IX.E.(2,3) page 54
(a) (6,1)
(b) (6,5)
(c) (4,-1)
(d) (1,5)

IX.E.(4) page 54
(a) (1) 83
(2) 85
(b) (1) 40 lbs.
(2) 33 1/3 lbs @ \$1.20; 66 2/3 lbs @ \$0.90
(c) (1) 75 mph
(2) rate of boat 6 mph; rate of current 3 mph
(d) (1) 60 ℓ of 40%; 40 ℓ of 60%

(2) $\frac{20}{3}$ pts. or 6 2/3 pts.

X.(A,B) page 56
(a) (1) T
(2) T
(3) F
(4) F
(5) T
(6) F
(b) and (c)
answers will vary

X.C. page 56
(a) (1) 8
(2) 25
(3) 11
(4) 13
(5) x^3
(6) $5x^5y^6$
(7) 32
(8) $\frac{1}{3}$

(b) (1) $2\sqrt{5}$
(2) $4\sqrt{6}$
(3) $x^3\sqrt{x}$
(4) $2x\sqrt{3x}$
(5) $6x^2y^3\sqrt{x}$
(6) $\frac{a}{8}\sqrt{a}$

X.D.(1) page 57
(a) 5
(b) 8
(c) 3
(d) 4
(e) 3
(f) 24
(g) 5x

X.D.(2,3) page 58

(a) (1) $3a\sqrt{b}$
(2) $3a$
(3) $75x$
(4) 48
(5) $2x^2y\sqrt{6y}$
(6) $3x\sqrt{6}$
(7) $16\sqrt{7}$
(8) 3
(9) 6
(10) x

(b) (1) $14\sqrt{2}$
(2) $8\sqrt{2}$
(3) $20\sqrt{3}$
(4) $3x\sqrt{y}$
(5) $16\sqrt{2}$

(c) (1) $2\sqrt{2}$
(2) $1 - \frac{2}{7}\sqrt{7}$
(3) $2(\sqrt{3} + 1)$ or $2\sqrt{3} + 2$
(4) $3 + \sqrt{21} - \sqrt{6} - \sqrt{14}$

(d) (1) $9\sqrt{2} - 3$
(2) $30 - 12\sqrt{6}$
(3) 117

X.E.(1) page 59

(a) (1) $\{4,-4\}$
(2) $\{0,3\}$
(3) $\{6,2\}$
(4) $\{-8,9\}$
(5) $\left\{\frac{2}{5}, -\frac{3}{2}\right\}$
(6) $\{5,-5\}$

(b) (1) $\{3,-1\}$
(2) $\{-5,1\}$
(3) $\{-1,4\}$
(4) $\left\{-\frac{5}{2},0\right\}$

(c) (1) $\{-4,2\}$
(2) $\left\{-\frac{1}{3},2\right\}$
(3) $\{4,-1\}$

X.E.(2) page 60

(a) $\{9\}$
(b) $\left\{-\frac{8}{5}, 2\right\}$
(c) $w = 6$
$l = 12$

X.F. page 61

(a) $\left\{\frac{27}{16}\right\}$
(b) $\{22\}$
(c) $\{52\}$

X.G. page 61

(a) $x > 3$ or $x < 2$
(b) $2 \leq x \leq 2\ 1/2$
(c) $-7 < x < 0$

XI.A. page 61

(a) $D = \{1,-3,0\}$, $R = \{1,2,4\}$
(b) D = any real, R = even #
(c) D = any real, R = squares
(d) D = any real, R = positive # & 0
(e) D = any integer, R = any odd integer

XI.B.(1,2,3) page 62

(a) A,C
(b) answers will vary

XI.B.(4) page 62

(a) (1) 3
(2) 3
(3) $\frac{5}{4}$
(4) $p^2 + 2p$
(5) $x^2 + 4x + 3$
(6) $x^4 + 2x^2$

(b) (1) 9
(2) $-\frac{1}{2}$
(3) 1
(4) -2
(5) x
(6) x